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cases only will remain which will require special treatment, usually by the addition of further cross references or new headings or sub-headings to the skeleton index. The utmost care must be bestowed on this "Key," as the facility in dealing with subsequent cases which is thus obtained will more than counterbalance a large amount of trouble in the original preparation. It would appear to be desirable to entrust the compilation of such a "Key" to a small committee, composed of men each with a special knowledge of some particular branch of astronomy, and all with sufficient enthusiasm for the science to take an interest in the little-regarded details of indexing. Such a committee could, with a comparatively small amount of work, achieve results the benefits of which would be felt by our science for many years to come.

We have only considered the question of the indexing of scientific papers in a general way; many of our conclusions may seem quite obvious, and others may seem to be based on unimportant details. The subject of indexing is so little understood, except by those who have had occasion to study it closely, that the importance of the considerations here advanced will probably not at first be admitted, but a very short practical experience will be sufficient to show the immense importance of the two points which we have laid down as essential, viz. *uniformity* and *simplicity*, and in order to carry out these essentials the plan of a skeleton index seems to be the most convenient and feasible one that can be adopted. The actual method of preparation of such an index is, of course, a matter for discussion, as to which many opinions may easily be maintained.

Until such a working index is, at any rate, in course of preparation, it would be well to defer further discussion with special reference to the science of astronomy; but it may perhaps be here noticed that it is very doubtful whether any index on such subjects as measurements of double stars, or observations of variable stars, can conveniently take the place of compiled catalogues such as we find in the published works of Burnham and others.

Note on a Crayon Drawing of the Moon by John Russell, R.A., at the Radcliffe Observatory, Oxford. By E. J. Stone, M.A., F.R.S., Radcliffe Observer.

There is at the Radcliffe Observatory a crayon drawing of the Moon, made by the celebrated artist John Russell, R.A.

The drawing is 4 ft. 11 in. by 5 ft., and bears the date 1795. It is on paper stretched on canvas, and the paper is composed of sections carefully seamed together; the chief seam being across the centre. The surface is not *perfectly* flat.

Mr. Russell died in 1806 May; but the drawing did not

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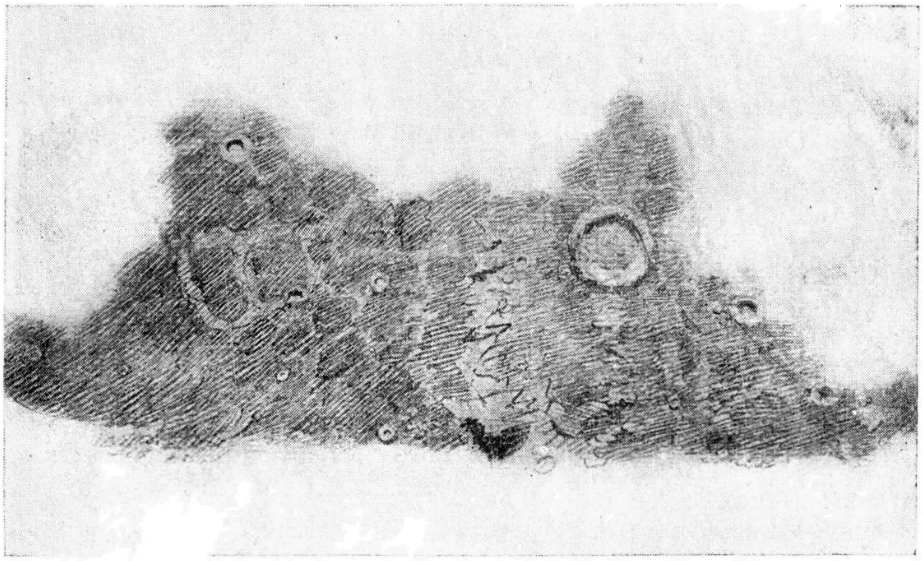
come into the possession of the Radcliffe Trustees until 1824 December.

When first received at Oxford the drawing was found to have been rather seriously damaged by wet on the journey. But Miss Russell, the artist's daughter—who was herself an artist, and trained in her father's methods—most kindly offered her assistance to restore the picture, and it was forwarded to her for this purpose. The drawing was returned to the Observatory on 1826 May 8, and it has remained there ever since.



Photographic reproduction of one of Russell's pencil drawings of Copernicus and its neighbourhood.

The crater Copernicus comes on the damaged portion of the drawing, and it would appear that Miss Russell, in her attempts at restoration, must have altered this part of the drawing, as it differs considerably from the original drawings of Mr. Russell of this crater, a copy of one of which is given above.

It appears that Mr. Russell's attention was first drawn to the desirability of the execution of drawings of the Moon by some skilled artist by Sir Joseph Banks, P.R.S. Mr. Russell was supplied with a six-inch reflector by Dr. Herschel, and he devoted to the work all the nights suitable for such work, which he could possibly spare, for nearly eighteen years.

A large number of detailed pencil drawings of different portions of the Moon's surface, made by Mr. Russell, are also in the possession of the Radcliffe Trustees; and many of them appear to me of an extremely interesting character.

The wet stains on the large crayon drawing, already alluded to, are principally on the blue background of the sky. They have always been visible since I have been at Oxford; but I have

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thought that within the last year or two they have become more pronounced, and that there were clear indications of mildew. I have, therefore, dismounted the drawing, and had photographs of it taken: (1) in the state it was found before any attempts were made to remove the mildew or dust; and (2) after the crayon drawing had been cleaned as far as I felt certain this could be carried out without damage.

These photographs have been taken by Mr. McClellan, an assistant at the Observatory.

I have thought that these photographs might be of some interest to the Fellows, as showing the general appearances of the Moon as it presented itself to the eye and was delineated by the hand of a skilled artist about a hundred years ago.

So far as I can judge, there are, as might be expected, during these hundred years, no distinct indications of change on the lunar surface.

I have appended a letter from Mr. Russell to Dr. Hornsby, which appears to me interesting, as giving some account of the views of the artist on such work. The original spelling has been retained.

Sir

I thank you for the fresh instance of your condescending goodneſs, in the Answer I am favor'd with to my last Letter, and your umerited willingneſs to give me aſsistance; which induces me to trouble you once more to read a Letter from me, containing my ardent Request to be indulged with a sight of the Drawing of Tycho you are so good to offer after Biachini, as I have never met with the Book you mention, which contains this and the Representation of other Spots in the Moon, with which I am somewhat acquainted as I have paid particular attention to these Spots, when the line of illumination falls directly upon them, by which I may receive considerable hints, and be enabled to determine, how much superior utility there is, in a Telescope of power considerably beyond the one I use, in deliniating the Moon; of which I am not so fully convinced, by the Print which Mons^{r} le Comte de Caſsini when in England inform'd me was drawn by means of the large Telescope in the Observatory at Paris.

I am greatly obliged by your observations respecting the Polar and Equatorial Diameters of the Moon, what I meant by the line of illustration, was the edge or boundary of illumination directly from the Sun; and I was fearfull when I expreſs'd a considerable difference between the Polar and Equatorial Diameters, I might be supposed to have made the measure before the whole Moon was compleatly illuminated, therefore I expreſs'd myself as attending to the real Margin of the Moon in an early state, one side illuminated directly by the Sun, and the other by the Earths Reflection.

Pardon Sir my want of clearneſs.

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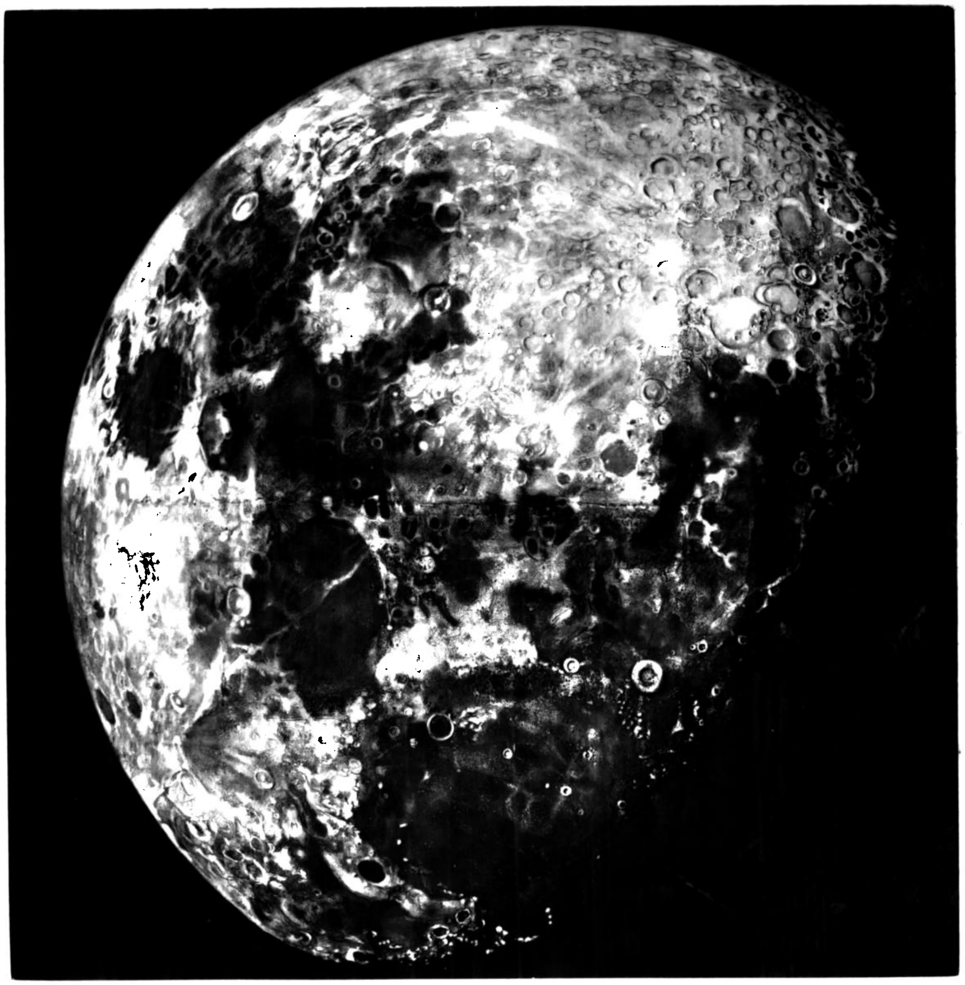

Woodburytype. *E. & S.*

PHOTOGRAPH OF RUSSELL'S CRAYON DRAWING OF THE MOON, DATED 1795, AT THE RADCLIFFE OBSERVATORY, OXFORD.

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In answer to your question respecting my Work, "If it be only one large Map," I cannot help troubling you with the following. About twenty-five years since, I first saw the Moon through a Telescope, which I now recollect must have been about two Day after the first Quarter; you will conclude how much struck a young Man conversant with Light, and Shade, must be with the Moon in this state; especially, as I was not taught to expect such clearneſs and expreſsion, as is to be found near and upon the indented Edge; a few Days after I made a small Drawing, but the Moon being at the Full, I was not struck in the same manner, and I made no more attempts, till an accidental poſseſsion of a powerful Glaſs awakened my attention to this beautiful Object once more, and for several years I have lost few opportunities when the Atmosphere has exhibited the Object of my study and imitation.

Before I began to deliniate the Moon I never saw any other representation, but the very inferior Prints to be met with in common Dictionarys, such unsatisfactory imitations, both as to incorrectneſs of Form and Effect, led me to conclude I could produce a Drawing in some measure corresponding to the Feelings I had upon the first sight of the gibbous Moon through a Telescope; that might give some pleasure to those who had view'd that Object attentively, for as to pecuniary profit, it was quite out of the question. After some succeſsful attempts I met with two Maps in a Work by Joh^e^ Bapt^a^ Homanno, Norinbergæ, one was a copy of the full Moon by Hevelius the other after Ricciolus: upon the sight of these, I thought it was needleſs to prosecute the subject, they having more correctneſs in the parts than what I thought had been executed; but observing how little the Effect was produced (to speak as a Painter) I continued to divert myself. About a year after I met with the folio Volume of Hevelius and was again at a stand, but by this time I found that my experience had not only made me more expert in imitating what I saw, but my powers of discernment and discrimination were considerably improved, and I persued the subject with redoubled ardour, and I scarce lost a moment' when the Moon was above the Horizon. About a year and half since I heard of the print after the Drawing by the late celebrated Astronomer Caſsini was publish'd in Paris. As I cou'd not but suppose the Work of so eminent a Profeſsor with the powerful Telescopes of the French Observatory must poſseſs very superior excellence; who knowing what had been already done, could not employ himself without attempting very considerable improvements, however I still continued my persuit and employ'd a correspondent to procure me one of the Prints, but without succeſs. On my return to London Mons^r^ le Comte de Caſsini being in Town, who having heard of my Attempt favord me with a call, and indulged me with a sight of his celebrated Grand-Fathers Moon, in which I found my expectations were not disappointed, and that this Print as far exceeds all others which I

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had seen in correctneſs and intelligence as it does in magnitude which is very considerable. But as you Sir would inform me, the Moon requires much attention to be well understood, being composed of so many parts, of different characters, so much similitude in each Claſs of forms, and of such a variety in the minutiæ composing those Forms and this difficulty also most considerably increas^{d} by the various effects caused by the different situations of the Sun; that I am perswaded many considerable improvements may be made, in correctneſs of Form in the spots, their situation and distinctneſs of parts; perhaps it was too hastily concluded that the large dark parts upon the Moon's Face, were Seas; I am apprehensive, that, if the Engraver has been faithfull to his trust, this must have led that great Astronomer Caſsini to represent these parts of one almost uniformly smooth, and uvaried effect, which upon a strict inspection will appear to be full of parts as various and nearly as multitudinous, as that portion of the Moon, which has generally been considerd to be Land, and is certainly elevated above the level of the former: even in the parts of the Moon which have been most considerd by Caſsini I think it will appear some considerable room is left for improvement. But there is a defiency which I have found in all these Maps of the Moon, and that is as I before hinted in point of Effect; the just proportion is not maintain'd in the Gradations between the inherent Light and Dark parts of the Moon, by which all pleasurable distinctneſs of character is produced. It is by my attention to this circumstance, my attempts has given some satisfaction to those Gentlemen who have honord me by inspecting the preparatory Drawings.

It was my intention first to produce a representation of the Full-Moon as it is generally illuminated by the Sun, but several very respectable Astronomers favord me with their opinion, and by their approbation of one of my Crayon Drawings, which describes the Moon two days after the first quarter, very easily prevaild upon me to alter my resolution and prefer this in which the boldneſs and the expreſsive elevations of Plato, Copernicus, Tycho, and some others near the Boundary of the Line of illumination, convey so distinct an Idea of these parts opposed to those situated near the centre of the Moon which very faintly expreſs their character, compared to the former, as they are nearly lost in the general Blaze of Light. When this is compleated I mean to return to my first intention respecting the full Moon in which are to be seen a thousand pleasing particulars which I think have not been publish'd. And if my Life is prolonged I doubt not but my inclination will be to persue such other representations as may be thought most advisable.

Dr. Herschell honord me by suggesting the very same Idea with which I understand your last Favor advises, the representing the whole Face of the Moon in the manner of the internal edge of Light as described in the gibbous Moon which I have mention'd to have drawn with Crayons, composing one general

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aſsemblage from each days effect upon the boundary of Light where the Light and Shade are most expreſsive from the commencement to the full Moon or from thence to the end of the last quarter. I shall certainly attend to this advice with all that Respect which is due to such advisers : but I fear the advantage will not be so great as might be expected as I am apprehensive all that distintion of Dark and Light in the composition of the Moon, w^{d} be lost, and also, that the Effect of elevations so pleasing and satisfactory in the edge of illumination in the Gibbous Moon, woud be indistinct and the whole appear very much confused ; as the agreeable effect is produced upon this Spherical Body, by the opposition of the parts distinctly seen near the edge to those which are more faint in the united maſs of Light, giving that satisfaction to the Eye which is produced in a picture well regulated by this conduct, a principle well know' among Painters and respected by conniſseurs. There is a difficulty in executing the Moon upon this plan which I have endeavord to surmount but in vain : you will I hope Sir have the goodneſs to honor me with such instruction as you may think will aſsist me respecting it, it is this, I know not how to expreſs upon this plan the parts of the New Moon till four days old or the four concluding days of the last quarter consistant with the rest, I hope my meaning will be understood when you consider the parts about Mare Crisium in the early stage of the Moon, they want that expreſsion which the rest have in the progreſsion of the Suns Rays, and which they have also a short time after the full Moon. The same is applicable to the parts about Grimaldus in the last quarter, I cannot conceive how these parts are to be renderd equally expreſsive with the rest unleſs one has the light represented as coming from the Right to the Left while the other are enlightend from the Left to the Right which must be extreamly improper. I apprehend those who have deliniated the Moon at least those whose works have come under my inspection, may have proceeded upon a plan different from that which I have adopted, and what at first sight appears the most Eligible, that of determining the parts with their situations with correctneſs at the first, and then of adding the different degrees of strength to the Outline by which means they have left this material persuit the Effect of the whole together particularly imperfect, and from the embarrasing multitude of Lines some considerable mistakes have been made, in that part of the work which to them must have been considerd as the most important, viz. the size of the Spots their distance from each other and their exact situation which can be demonstrated, but wou'd add so considerably to my prolixity for me to attempt, as to add to my confusion in trespaſsing more upon your Time, by that which is already so very prolix and I fear not free from an impertinent appearance.

My first efforts Sir were made with Crayons, representing the colour of the Moon in its general form according to the particular Phase, upon this I laid the larger Spots of Mediteraneum

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Serenitatis Tranquilitatis &c &c—these I adjusted by degrees giving them their general Forms and grand bearings endeavouring to preserve with as much truth as time would admit the proportional difference of dark & Light; by which one part is subordinate to the other; and proceeding so long as the Moon was to be seen: executing the minutiæ as far as time would permit, being always attentive to the most considerable parts before those which are subordinate. The Effect of the Moon thus produced, surrounded by a dark Blue colour has a novelty as well as an exprefsion in its appearance, which has given some pleasure to many Gentlemen whose approbation is very flattering to me. But I am very sensible that in a Drawing of fourteen inches Diameter the crayons such as I use are not proper to exprefs the minutiæ with accuracy however proper for the effect they may be, I have therefore contented myself by making that part which was in my power something correct. I used other means in drawing the parts which are more minute, the fine point of a black Lead pencil I think the best for the purpose and have furnish'd myself with a great number of Drawings in this manner, of the different Spots in the Moon under the circumstances they present themselves in the different Phases, from these Drawings and in continual reference to the Moon itself, I am proceeding upon the larger picture, producing the effect from the Drawings made with Crayons and the small parts from those with black lead pencils.

As a painter it is no vanity for me to say, much may be done in regard to accuracy by the Eye only afsisted by the Telescope. We are used to consider the size, form and proportion of parts, it is the first principle of our Art, it must be acquired; but I have not presumed upon this imaginary power of correctnefs, the Eye is capable of being deceiv'd, and as I want to approach as near as may be to perfection, I am induced to measure the distances of as many parts as will set the rest in their proper places. As I have no micrometer such as would describe minutes &c. and if I had, thro' my inexperience and want of sufficient power of calculation, I should be embarrafs'd thro' the Moon's Variation in its Diameter, at different times. I have constructed one which serves my purpose. A hair is strain'd in the Focus of the short Tube of my Telescope, upon this Hair is made marks of different sizes and at various distances. A scale upon paper has been fixt upon a wall at a certain distance, and by this scale I have afsertain'd the size of the Marks and the Space which separates each from the other: a counter scale proportion'd to work the large picture with, is all I need to keep my mind satisfied that I do not proceed in Vain for I have by a particular method prevented the inconvenience which the want of a crofs Bar and perpendicular would otherways have occasion'd.

It will be some time before I have compleated my intention, as I have many engagements and this I only esteem as my

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amusement. I do not promise to present my efforts to the public, that must depend upon circumstances.

That with which you conclude your Letter has not escaped my notice. The Libration of the Moon from North to South as well as from East to West. I am much obliged to you Sir for this and the other observations, in which you have freed me from my embarraſsments. I hope to be pardon'd if when other difficulties arise I am constrain'd to make application for your instruction.

I have the honor to be with very great Respect
Sir
Your very much obliged
and most obedient
humble servant
John Ruſsell.

Mortimer Street
Feby 19, 1789.

Details of the Total Solar Eclipse of 1896 *August* 8–9 *for Kushiro, in the island of Yezo.*

(*Communicated by the Superintendent of the "Nautical Almanac."*)

The following details are communicated to the Society, as it is understood that Kushiro has been selected as one of the stations to be occupied by the observers of the Joint Permanent Eclipse Committee, who are going out to Japan next August. Should a second station be selected within fifty or sixty miles of Kushiro, the circumstances of the eclipse for it can be computed, with sensible accuracy, from the subjoined equations.

The details for Horonai, on the N.E. coast of Yezo, will be found in *Nautical Almanac Circular*, No. 15.

The elements adopted in the computations are those published in the *Nautical Almanac* for 1896, p. 416.

Assumed position of Kushiro... ... Long. 144° 22′ E., Lat. 42° 58′ N.
(reduction to $l - 11'{\cdot}7$)

		d	h	m	s	Contact from N. Point.	Contact from Vertex.	Sun's Altitude.
Eclipse begins	Aug.	9	2	6	46	55° W.	94° W.	53°
Totality begins	„	9	3	16	52	Duration 2ᵐ 35ˢ·5		42°
Totality ends	„	9	3	19	27			
Eclipse ends	„	9	4	23	44	123° E.	73° E.	30°

Local mean times and *direct* image.

For any place not far distant the geocentric north latitude being l, and east longitude λ, the Greenwich mean time t of